The *Isis* cumulative bibliography 1913-65

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An account is given of the history of the *Isis* Bibliography Project sponsored by the History of Science Society (USA), the object of which was to cumulate approximately 100,000 entries contained in the ninety critical bibliographies published during the years 1913-65 in the Society's journal *Isis*. The *Isis* cumulative bibliography has been published in five volumes over the last twelve years. The first two contain all the entries concerning an individual or any aspect of his work, arranged alphabetically, followed by an alphabetical listing of all entries relating to scientific institutions. Volume 3 (Subjects) comprises references to the history of science, medicine and technology, unrestricted by period or civilization. Volumes 4 and 5 (Civilizations and periods) contain entries dealing with a particular period or civilization. Problems of cataloguing, classification and indexing are discussed.

*Isis*, a journal for the history of science and its cultural relations, published by the History of Science Society (USA), first appeared in Belgium in 1913 in French, its founder being the distinguished historian of science, George Sarton. With the outbreak of the first World War, Sarton emigrated to the United States, and continued to edit the journal in English in that country. Right from the beginning, he included a list of references to the literature of the subject, often accompanied by short annotations. These 'Critical bibliographies' which he compiled were based on information or offprints supplied by colleagues from all over the world. Not infrequently, as was the case in the early years of the Critical bibliographies, the offprints did not bear the full references and the information was not accurate. Although there were author and name indexes to each of the Critical bibliographies, there was no subject index. Indeed, in all the years of its publication *Isis* had not had a subject index to the body of the periodical either.

When *Isis* was approaching the fiftieth year of its existence and the History of Science Society, which had taken over responsibility for its publication, had been awarded a small grant towards the production of an index, the Editor, Professor Harry Woolf, who was spending a sabbatical year in London, asked me to examine the problems involved and to make recommendations. It became immediately apparent that the project fell into two parts: (i) the main body of the periodical, and (ii) the Critical bibliography which presented different problems. I made rough estimates of the entries involved in (a) a fully analytical index, that is an index which contains entries to the contents of articles, papers and other material, in the way a book is indexed, and (b) an index in which author and subject entries would be made only of the main subject of articles, news items and reviews. I found that even in the first case the number of entries required for the Critical bibliography would considerably outnumber those for the main part of the journal and make the index very difficult to consult. Some sort of weighting of index entries would have had to be used, for otherwise it would have been impossible to distinguish between some passing reference to a subject and a significant contribution to it. In the second case, the problem reduced to that of the Critical bibliographies alone, since the latter include notices of all the papers and important notes published in the main body of *Isis*.

There seemed to be a general consensus of opinion that the Critical bibliographies formed an essential tool of research and that a subject index to these was most urgently needed. I recommended, therefore, that the two parts should be treated separately and I suggested tentatively that the Critical bibliographies should be cumulated and republished in a fully classified form together with the necessary subject indexes. Other methods of indexing were considered, such as a keyword-in-context index and the traditional alphabetical subject index. In making a pilot index to one Critical bibliography I found that the subject naturally tended to an alphabetically-classed treatment, so much so that I came to the conclusion that a classified list with an alphabetical index would be greatly preferable. In a way this is not surprising since Sarton, who gave so much thought to the organization of the Critical bibliography, adopted a highly classified arrangement at a time when this was quite unusual. Several other considerations made the publication of a cumulative bibliography seem the more desirable alternative. A cumulative bibliography would give researchers direct access to the source of the information, instead of merely referring to the relevant entry in the Critical bibliographies. The references, particularly in the early issues of the Critical bibliography, were often inaccurate and insufficient. Moreover, in the course of its existence the area of the field covered changed. In the early years Sarton included many items that could hardly be considered as immediately relevant to the history of science. Material of this nature has not been covered for some time. Furthermore, many publications were quoted...
more than once—sometimes in several issues of the Critical bibliography—as they were reviewed in different journals. In a cumulative bibliography they could be easily combined. Also, there was great inconsistency in cataloguing throughout those fifty years.

Following informal discussions on my reports, an Editorial Committee was set up by the History of Science Society under the chairmanship of Professor I. B. Cohen, George Sarton's successor in the Harvard Chair, and a substantial grant obtained from the National Science Foundation towards the production of a cumulative bibliography. It was Professor Cohen who suggested that, as a first stage in producing the cumulative bibliography, we should publish a volume containing all entries relating to the great men of science and other personalities of importance to the history of science, arranged alphabetically, forming as it were a name index (to persons) to the Critical bibliographies, a kind of bi-bibliography. In addition, this first part of the bibliography was to contain not only secondary literature, i.e. the literature on the personalities, but also editions of original texts. I was only too ready to accept Professor Cohen's suggestion, because I had become convinced that in the history of science the biographical aspect was the most important. To discover the relative importance of the various aspects from which the literature of the subject can be viewed, in other words of the different facets of the subject, I drew up a list of titles chosen at random from one issue of the Critical bibliographies, each showing several of these facets, and asked a number of historians of science to indicate these in order of importance. An analysis of the replies showed that wherever the name of a man of science occurred in the title, the biographical facet was put first; period came second; subject third; and the rest afterwards.

**Personalities and Institutions (Volumes 1 and 2)**

The project having been approved by the Editorial Committee and the Council of the History of Science Society, work began in 1964. Sarton had had the entries published in the Critical bibliographies cut out and pasted on 5 x 3 cards and filed in alphabetical order of author. Various methods of coping with the original entries from the published issues of *Isis* were investigated and found to be exceedingly expensive. It was, therefore, decided to have the Harvard cards copied and sent over here. The cards occupied 102 drawers and it was estimated that the number of entries was approximately 100,000. Where were we to put all those cards, which arrived in cardboard boxes? Professor Rupert Hall, who had recently come to Imperial College to the new Chair of History of Science and Technology, kindly stepped into the breach and offered a spare room in his Department so that work could begin. Moreover, the staff of the College Library, which at the time was housed in the same building, most generously helped by the loan of equipment.

I soon discovered that there were entries missing, including one whole issue of the Critical bibliography, and the cards needed checking against the volumes of *Isis*. The next stage involved pulling out all entries which referred to a named person, either in the title or in the annotation, or to editions of texts. The total number of personalities was in the region of 10,000. The Editorial Committee decided that the dates, if known, or at least some time indication, should be added to the names, both for the sake of convenience and in order to identify the personality in question. The personalities were arranged in alphabetical order and under each the entries appear in alphabetical order of authors. However, for those personalities for whom there were more than, say, twenty entries (over 200), these were broken down by a schedule that in outline was arranged into reference works, biographical material, archives, texts, comments and followers. If there were many comments these were arranged by subject in the order of the main classification to which I will refer below.

The section dealing with Institutions, at the end of Volume 2, includes references to the history and work of an Institution or Society. These are also listed in alphabetical order.

**Identifying personalities**

The identification of personalities was a much more difficult and time-consuming task than might be imagined. It must be remembered that the entries were in many languages, and even Latin and Greek names are often hardly recognizable as rendered in some languages. Moreover, the persons who figured in the entries included not only scientists of modern times and men of learning of all ages, but also personalities who played some part in the history of science. I had to bear in mind that the first part of the Cumulative Bibliography would also constitute a name index to the Critical bibliographies. Very often it was necessary to go back to the source, because the name mentioned could not be found in any biographical dictionary or encyclopaedia, and sometimes that source was not available, particularly as many learned journals had been destroyed during the Second World War. Also, in some cases, the titles of works occurred without indication of author. Where full details were given, we had to trust them, in view of the number of entries involved, but this led to some cases where, owing to printing errors in the original, one personality appeared under two different forms. Most of the wrongly filed entries were spotted before the first two volumes went to press, but there were a few which had to be put right in the Corrigenda (in Volume 5).

Problems of translation, and particularly transliteration, can cause much difficulty. An entry referring to one 'Gaxley' caused headache until we discovered that it referred to Huxley, re-transliterated from the Russian. Similarly, some entries that should have been under
Jacob Hermann were entered under Jakob German, an entry that belonged under G. V. Rikhman, and one under Sven Vaksel should have been under Sven Waxell. Identifying Carlos Estefano gave rise to searches, until it was discovered that he was better known as Charles Estienne. Two German names, belonging to authors of an anatomical atlas, led to a great deal of confusion. Johann Remmelin appeared as Johannes Rümelin in some entries, and Stephan Michelspacher as Michel Spacher. Only one Porphyrios is mentioned in Sarton's *Introduction*², but in fact we found that some entries referred to Porphyrios of Gaza. Similarly, it was discovered too late that an entry that should have been under Eustathios, Bishop of Antioch, was listed under Eustathios of Thessalonica. Identical names but different dates caused confusion between Carlotta Buonaparte (1780-1825) and another member of the family of the same name who lived from 1802-39, and between one Alexander Chisholm who lived in the eighteenth century and another in the nineteenth. There were also two Laurentius Petri, who both lived in the sixteenth century.

Arabic names caused endless trouble, but although I was responsible for the initial sorting (with the help of course of Sarton's indexes to his *Introduction*²), I relied on a number of Arabic experts for help. I also had to consult Indian, Chinese and Japanese experts. Even so, I slipped up by entering Ammei Aida under Ammei, Aida, instead of Aida, Ammei. Nearer home, the Belgian Philippe Vandermaelen also appeared as Philippe van der Maelen with an entry under 'Maelen'. I will revert to the problem of 'von', 'van der', etc. in discussing the part of name chosen.

The need to assign dates to the personalities named gave rise to difficulty. There is great variation in dates found in reference books. Two reference books often give two different sets of dates. Those for Volcher Coiter in *Webster's biographical dictionary*, for example, are 1534-90, whereas Garrison and Morton⁴ gives 1534-76. It is bad enough when books of reference differ, but what is one to do when the same biographical dictionary gives two entries with two slightly different sets of dates for one personality? Thus, the Spanish explorer Juan Manuel can be found in that form, followed by the dates 1282-c. 1349, in *Webster's*; he also appears there under Manuel, Don Juan (no reference from one to the other), followed by 1282-1349. Evidently two authorities wrote two different entries, and one was more confident of his dates. In view of the magnitude of the project and the limited resources available, it was of course impossible to conduct historical research, and sometimes an *ad hoc* decision had to be made.

What form of name?

Difficulties in choosing the form of name, both for personalities and for authors of entries, led me to investigate the ways in which different countries deal with these questions, bearing in mind that *Isis* was an international review devoted to the history of science and its cultural influences, and that the entries were in many languages. I wrote a short paper on the subject⁵ in which I expressed the hope that agreement would be reached on an international level. However, the Editorial Committee decided that the *Anglo-American cataloguing rules⁶*, of which a new edition was published soon after the project began, should be adopted. This laid down that the form of name chosen should be that used in the literature, and the rules should follow those adhered to by the country to which the personality belongs. Thus, Giovanni da Ravenna is entered under this form, with references from John of Ravenna, and Ravenna, Giovanni da, and not under John of Ravenna. Similarly, there are entries under Johannes von Gmunden and Johann von Sachsen, with the appropriate references; yet I was criticized by a French reviewer for using a 'bastard language', because the references I made under 'John' were necessarily of a bastard kind.

A dilemma occurs where a name has been anglicized, particularly in the case of Latin and Greek names, and then one must choose between well-known forms such as Aristotle, Ptolemy or Pliny, and the Greek and Latin versions. This practice cannot be consistent, because there are no English forms of some of the lesser known ancient names. However, it was decided to adopt the well-known forms where they existed; Saints, Popes and Kings are also entered under the English form of their names.

Another difficulty arose in connection with different methods of transliteration from, say, the Russian, Chinese and Japanese, adopted in different languages. When authors in these languages write for a French periodical their names are often transliterated by the French method, and for a German journal the German method is adopted. Moreover, it was not always easy to discover the form of name in the original. I fear that this problem has not always been satisfactorily solved.

As regards institutions, international bodies have been entered under the English form of the name, with reference from the French form, unless better known under the latter. Foreign academies and societies have been entered in the vernacular, with references from the English translation. Universities appear under the city in which they are located, unless better known by a proper name, in which case reference has been made from the city. The same procedure has been followed for botanical and zoological gardens, hospitals, libraries and museums. Where they exist, the English form of names of foreign towns were used.

Under which part of name?

It was not until the end of the sixteenth century that the practice of listing persons under their family rather than their 'given' name began to gain ground in Western
Europe. Indeed, arrangement by given name continued for some time and many well-known seventeenth century men of learning are still better known under their first name, for example Galileo. The principle adopted in the *Isis cumulative bibliography* has been to choose that part of the name used most frequently in the literature, both for Western and Oriental names. In choosing the entry word for the latter I have had the advice of experts. In all cases, reference has been made under all parts of the name under which the user might be looking for the personality in question.

In the case of compound names in European languages the first part of the compound has been used as the entry word (in any case, so many of these tend to become hyphenated), but where necessary reference has been made from the second part of the name. The position regarding names with prefixes has been more difficult to solve, because the rules differ according to the nationality of the person, and it is not always easy to know whether an author in whose name ‘van’, ‘van der’, or ‘von’ occurs is in fact a Dutchman or German, in which case the prefix is not the entry word (unless it has become part of the name as in the case of Vandermaelen which I quoted above), or is a naturalized American citizen. Similarly, a person like de Broglie would be entered under Broglie, but unless one knows that de Morgan and de Moivre are Englishmen one might be tempted to list them under the main part of their name.

**Form of citation**

In the early days of the *Isis* Critical bibliographies no standards had been laid down either regarding rules of cataloguing or periodical abbreviations. The first led to the same entry turning up in various guises, the second to some abbreviations of periodicals being almost unrecognizable. Both these faults had to be rectified; names of authors given in different forms had to be checked, references verified, details of missing volumes of multi-volume works provided. In the case of personalities for whom bibliographies were available, entries were added to those which had originally appeared in the Critical bibliographies. For periodicals it was decided to adopt the American standard of abbreviations; this was in some ways an unfortunate decision as *Isis* has now gone over to the abbreviations used in the *World list of periodicals*.

**Production**

The same method of production was adopted for all the five volumes, but as this was decided upon at an early stage in the project, it may be as well to describe it at this point. When investigating methods of producing the *Cumulative bibliography*, one consideration was paramount in coming to a decision. Our copy, for the reasons which I have discussed, was highly sub-edited and, as I have mentioned, in many languages. No traditional printer would have accepted the entries in that state and it was realized that, whatever method of production was adopted, they would have to be retyped. That left two methods to be considered if the two operations were to be reduced to one: (1) photographic; (2) computer print-out. I was greatly attracted to the latter, particularly as it would have reduced the work on that part of the *Bibliography* in which entries on particular periods and civilizations were to be reproduced. Advice was sought from experts, but as a result the use of a computer was rejected in view of the high costs and the restricted output format. It must be remembered that this was some years ago and the decision might well have been completely different if the project were being considered now.

The use of a photographic method was then investigated. At first we hoped that the British National Bibliography, which was using the Fotolist process, would be able to produce the Bibliography, but as a result of a short test and fuller investigation this was not found feasible. Eventually, agreement was reached with Mansell who had first developed their methods for the production of the photo-lithographic edition of the 262 volumes of the *British Museum general catalogue of printed books*. The entries were typed on to separate cards on an IBM 72 typewriter with library keyboard and interchangeable roman and italic golf balls, the names of personalities being set on the IBM 72 composer. The names of Institutions are in letter gothic, as are the subheadings and classmarks in the later volumes. Finally, when the sequences were complete they were handed over to Mansell who then photographed the cards by special cameras on film. This was cut into column length and made up into pages of negative which were printed down to plate to be reproduced by conventional offset lithography.

**General plan of the Bibliography**

Although the original plan of the *Cumulative bibliography* was that the first part, listing personalities and institutions (Volumes 1 and 2), should be followed by one in which the material was to be organized by period or civilization, it was decided for practical reasons to publish first the part covering the general history of science and the special sciences, unrestricted by period or civilization, including special aspects of science and scientific disciplines. These two parts, which occupy Volumes 3, 4 and 5, are closely classified, but in order to avoid breaking up the page too much, and thus making the work difficult to consult, headings were inserted only for main divisions and the more important subsections. An index to subject classmarks is at the end of Volume 3 and again at the end of Volume 5, the latter covering all the classmarks which appear in Volumes 4 and 5.

**Problems of classification**

Needless to say, the problems of classification presented particular difficulties. To adopt one of the
standard schemes for subjects would in many ways have been easier, but it would have required a more extensive index, which will be clear from the following remarks. During the years that Sarton edited *Isis*, no fewer than seventy-nine bibliographies appeared under his direction, most of them in a classified sequence. He was clearly interested in classification and he continued to make changes in the arrangement which he had at first adopted. Not until 1926 did he evolve the scheme to which he more or less adhered until he resigned the editorship in 1952. Subsequently, a Committee of the History of Science Society was formed to revise and simplify the classification, which, in essence, has been adhered to ever since. My interest in classification, particularly in what seemed to me to be an early attempt at faceting, led me to make a study of Sarton’s and other schemes for classifying material on the history of science and to devise a scheme based on the former by which the material in a cumulated version of the *Isis* Critical bibliographies could be classified.

A scheme for the classification of the history of science, medicine and technology differs from a scheme for a specialized field of knowledge in that it has as one of its facets the whole of science, medicine and technology and thus is in some ways similar to a general scheme of classification; on the other hand, it is special in that it considers so much of knowledge from a particular angle. The subject fits naturally into a three-dimensional matrix in which period/civilization is on the first co-ordinate axis, the subject on the second, and the aspect from which the subject is considered on the third. The question which Sarton discussed more than once is whether period/civilization or subject should be the preferred facet. A historian of a particular science who is interested in the history of his subject irrespective of period might well prefer the subject to be the first facet, so that all the material he requires would be collected together. However, most historians of science, even if their main interest lies in a special subject field, are usually concerned with a particular period, and it was therefore decided to retain the period/civilization facet as the main one. This means that in the scheme which I have devised for the *Cumulative bibliography* all titles that relate to the history of science or the sciences in one particular civilization or period and to not more than two centuries during the modern period are first of all classified by this characteristic. Titles that refer to two centuries or to a personality who strides two centuries are classified in the later century. The only exceptions are titles that deal with the 19th and 20th centuries combined or with the 20th century alone. They are treated as if they were general.*

All aspects of a subject, however narrow, are classed under that subject, so that, for example, material on the philosophy of science and the sciences or on the social relations of science and the sciences is distributed among the subject fields. The emphasis in this scheme is on the history of each subject, and so, however narrow the subject, all its aspects are gathered together. A philosopher of science or a sociologist of medicine will have to consult the indexes to find all the entries of interest to him.

The notation has been chosen to emphasize the three main facets: numerals denote civilizations and periods, capital letters subject fields, and lower-case letters aspects and forms. Lower-case letters are also used to form compound subjects (as a facet indicator) and to extend subjects in a non-systematic manner. The notation is ordinal, not hierarchical, which has greatly reduced the number of symbols needed.

**Subjects (Volume 3)**

The order of subjects which I have chosen is based on the arrangement of subjects used in the *Isis* Critical bibliographies for the modern periods, which leans heavily on some 19th-century classifications of knowledge. It begins with science in general (A), followed by philosophy (AP), mathematics (B) and the physical sciences (BZ), including physics (C), chemistry (D) and astronomy (F); the earth sciences (FZ), including meteorology (G), geology (GG), geography (H) and cartography (HK); biology (J), including botany (K) and zoology (L); the sciences of man (M), including anthropology (MA), psychology (MG) and the social sciences (MP); medicine (NS); agriculture (SA); technology (TX); and finally the history of some ancillary disciplines (Y), including historical sciences (YA), linguistics (YJ), education (YR) and bibliography (YS), which, when applied to any of the foregoing subject fields, appear in the aspect subdivisions which I will mention later. The schemes devised for the different subject fields are eclectic and lean heavily on schedules prepared by others. They are not very detailed, but they are faceted. Only a small proportion of the entries deal with very specific topics. On the other hand, in the history of science spotlights are often turned on here and there on some of these in a manner that is probably accounted for by historical rather than scientific reasons. For example, a scheme for organizing writings on ‘medical bacteriology’ would provide for the systematic arrangement of all the causal agents, whereas historical writings spotlight certain diseases, such as the plague or smallpox, because they were historically far more important and had more serious social consequences. Similarly, in the field of general and solid mechanics, which has the classmark CD, the topics of gravitation and inertia occur much more frequently than others. To avoid complicated systematic schedules to accommodate these topics I have used the device of non-systematic extensions introduced by the lower-case letter z so that, in the example quoted, CDgz and CDzi represent gravitation and inertia respectively. I cannot describe

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*This is because the history of many scientific subjects is confined to these two centuries.
here the way in which each subject field has been classified, but Volume 3 contains a detailed discussion of the scheme with special reference to subjects and aspects (pp. 629-31).

Each subject, however narrow, is subdivided by the use of lower-case letters into what may broadly be described as: its general history (c), or where applicable with its prehistory (bz); followed by bibliographical (cb-cv), biographical (d) and historiographical aspects (f, g, h); its psychology (j) and philosophy (k, m); communication in (n), and teaching of (o), the subject; its sociology, including organization (p), institutions (q), the profession (r) and its relation with society as a whole (s); its relation with the humanities (t); its popular aspects (u); its history in different linguistic and ethnic groups (v); and in different countries (w); and finally, equipment, techniques and instruments used (x).† Many of these aspects are also considered as disciplines, the history of which is the subject of study. They are of marginal interest to the historian of science. The history of bibliography, historiography, linguistics, and education appear as aspects of the history of science. It may be thought difficult to distinguish between subjects when they form the core of the study and when they appear as aspects of the history of science, medicine or technology, but I have not found it difficult to make this decision. For example, a general work on the history of psychology is classed under psychology, but the psychology of discovery in a special field is an aspect of whatever subject is involved. In the same way, a history of sociology is classed under sociology, but the sociological aspects of a subject are classed under the latter with the aspect code added.

Geographical and regional subdivisions are important in the subject field, and they are treated in different ways. First of all, there are the cultural regions, mostly associated with particular periods of history, references to which are collected in Volumes 4 and 5 which will be discussed below. Then there are the geographical subdivisions which represent the national regions, largely based on the contemporary situation, under w. When it is necessary to denote these regions purely as the location of sources or studies, they are at the beginning of the aspect schedules under a, following exactly the same pattern. The different aspects of a subject are combined in reverse of schedule order—by the use of the hyphen—with the effect that organizational, professional and general social aspects which are very relevant to the history of a subject in a particular country are brought together, so that, for example, the medical profession in Great Britain will be analysed as medicine—Great Britain—professional aspects (Nwe-r). Instead of using a completely different notation for cases where the region is the subject rather than the aspect, I have used the second letter from the a and w aspect subdivisions, but in capitals, and added them to the code for regional subjects. I had to differentiate between, for example, the history of the geology of North America (GGGb) and the history of American geology (GGwb) which may include, say, the geology of France (GGFwb) or Great Britain (GGEwb) studied by American geologists; the fauna of New Zealand (LRW) may have been studied by British zoologists (LRWwe) and the code must express these different elements.

Two further points needed careful thought. One concerns the need to distinguish between history as a record of events and history as a subject of study. For example, it is difficult to distinguish between records of seismological phenomena and the historical study of these. Consequently, I decided not to make a distinction. On the other hand, I distinguished between the teaching of the history of the subject (under g) and the history of teaching the subject (under o), although the two sections are organized in the same way. The other point relates to the classification of instruments, always a cause of difficulty. They are classed in the appropriate scientific subject with the last of the aspect subdivisions x added, but they may appear under the relevant technological subject. If the principle or theory of their construction is involved, then they are classed in science, but their technology is included in the relevant section under technology.

Civilizations and periods (Volumes 4 and 5)

In most recent chronological classifications the division of history is into ancient, mediaeval and modern. Sometimes the division Renaissance is interposed. These divisions are of comparatively recent origin. The term 'Middle ages' has only been current since the 18th century, and the use of the word 'Renaissance' to designate a particular historical period only originated in the 19th century. Strictly speaking, this division applies only to European and Near Eastern civilizations and has little meaning for the rest of the world. The arrangement I have adopted makes this division into Western and Near Eastern civilizations on the one hand, and Eastern and American civilizations on the other, more explicit. As already mentioned, the notation for the civilization/period facet is numerical, consisting of one or two digits. The order is not hierarchical, but ordinal.

The arrangement of subjects under each period section follows the subject classification outlined above. In the Isis Critical bibliographies, somewhat different subject schemes are used for ancient and modern periods. Lund and Taube9 some time ago proposed that literature

†Sections a (geographical subdivisions used for location of sources, studies, etc.) and b (bibliographical form) are only used in conjunction with one of the other subdivisions, the one exception being bz.
should first be divided by the period in which it was written and that a different scheme of classification should be used for each of these periods. Of course, they must have had mainly primary literature in mind. For a number of reasons I have applied the same overall scheme to all periods. First, the scheme would otherwise have had to be enumerative rather than faceted; secondly, using the same subject scheme makes it possible to change the citation order as between subjects and periods, if desired; thirdly, the task of making a comprehensive index for different schemes would not have been easy. However, the way the scheme is constructed allows considerable latitude both in the choice of more general headings when the borderlines between subjects are vaguer, and in the use of non-systematic subject extensions. Also, even if a subject was not known in earlier periods under its present name, there is no reason why it cannot feature as a term in the classification. For example, although Lamarck was the first to use the term 'biology', this is no reason why a biological topic discussed by a Renaissance scholar may not be classed under biology.

Although there were many references to papers and monographs dealing in general with a period or civilization, the greater number dealt with one or more personalities, and these are listed in Volumes 1 and 2. To make Volumes 4 and 5 complete, it was essential either to reproduce the entries or make reference to them. The decision as to which method was adopted was based entirely on practical reasons. If the user could be spared the trouble of having to look into another volume without adding too greatly to the bulk of the material in those volumes, then the item in question was rephotographed; if there were too many entries relating to a particular subject, then a reference was made to the relevant sections in Volumes 1 and 2. No distinction has been made in dealing with primary and secondary literature. They are listed in one sequence under the appropriate heading.

Prehistory to Middle Ages (Volume 4)

Volume 4 contains all entries referring to the early periods, including the Middle Ages, to Asian cultures, except the Near East, to African and American cultures. The schedule begins with prehistory in general (1), including the prehistory and early civilizations in Europe, followed by the prehistory and ancient civilizations in the Near East and Mediterranean area (15), including classical antiquity (25). This section concludes with a sub-section (29) on Christian civilizations that are too early to include in the Middle Ages. The next main section covers the prehistory and indigenous civilizations of Asia (except the Near East) (3), subdivided into large geographical areas representing the different cultures, followed by those of Africa (46), excluding North Africa which is included in 15, and America (47). When these have become fused with Western cultures they are treated like the rest of modern knowledge, a term from the western aspect of the aspect schedules (national histories) being added. The only anomalies concern the countries of Western Asia. Their ancient history is included among the ancient civilizations in the Near East, and in mediaeval times most of them are classed under Islam (54). A general section (49) has been introduced between the non-Western civilizations (3) and the main section on the Middle ages (5), in which are classed titles that deal with the Ancient world and the Middle ages combined. All material on mediaeval Latin Europe is included in the section on the Middle ages (5). Subdivisions are: Byzantium (52), Armenia (53), Islam (54) and Jewish mediaeval culture in the Islamic world (55). In section 58 is classed material that refers to both the Middle Ages and the Renaissance.

15th to 19th centuries (Volume 5)

Volume 5 contains all entries which refer to the modern period from the 15th to the 19th centuries. The Renaissance (6) not only covers the period 1450-1600 but has been extended to include the 15th century generally. After 1600 the division is by century. Although this is a somewhat artificial subdivision, it has been retained as so much modern history is still treated by century. Titles referring to two centuries are classed according to the later century.

Volume 5 also contains Addenda and Corrigenda to Volumes 1, 2 and 3.

Subject indexes

There are alphabetical indexes to subject headings represented by classmarks (irrespective of whether these are followed by the description of the subject) at the end of Volume 3 and Volume 5 (including headings occurring in both Volume 4 and Volume 5). It must be emphasized that neither is a subject index to individual entries. They are essentially indexes to the terms in the classification and to the combinations of subject and aspect. They not only lead the user to the classmark (the references are to classmarks not to page numbers) under which he or she will find the entries relating to the subject on which information is sought, but they direct the user to those aspects of a subject that are distributed or scattered in the systematic arrangement. On the other hand, if the topic is very specific, there may be no entry under it in the Index because there is no special section on the topic in the Bibliography. In that case, reference must be made to a more general heading. For example, although the word 'copper' does not appear in the index, there may be references to the subject among the entries under 'Non-ferrous metals' or 'Metalwork'.

As far as the subject fields are concerned, in accordance with the rules of chain indexing, there are no inverted terms, such as 'Chemistry, organic' or 'Chemistry, physical', since all entries relating to chemistry are listed under D. Where they are not, such as for plant
chemistry (KD) which is under botany or physiological chemistry (OG) which is under physiology, the relevant classmarks are given. In the Index to Volumes 4 and 5, which was more difficult to compile than that to Volume 3, the periods are listed under which entries on chemistry may be found. Since each subject is subdivided in exactly the same way into its different aspects, the Index to Volume 3 only gives the subject code by itself, but lists under the aspects all those subjects under which that aspect appears. For example, chemical terminology which is one section under chemistry is entered under ‘Terminology: chemistry’ only, because the section is part of the main section ‘Chemistry’. In the Index to Volumes 4 and 5, on the other hand, an entry had to be made under ‘Chemistry: terminology’, since the user would otherwise have to go through all the sections on chemistry to locate references to chemical terminology.

A departure has been made from the usual rules in the case of some of the aspect subdivisions. For example, a reference to British ornithological societies (code LYwe-qd) would normally be entered under ornithology (LY), under British Isles: ornithology (LYw), and under Learned societies: British Isles: ornithology (LYwe-qd). It was decided that it would be more helpful if in the Index the last entry were in the order Learned societies: ornithology: British Isles. Moreover, the entry British Isles: ornithology was supplemented by an added entry or reference from British Isles: zoology so that anyone requiring information on the history of British zoology would not have to scan the whole of the section on the history of the British Isles. This situation applies to all countries and also to some other frequently occurring aspects. To distinguish between references to entries in the body of the Index and to references to headings within these large sections, capitals have been used as initial letters for the former and lower-case letters for references to headings for the latter.

Author index

An Author index to Volumes 3, 4 and 5 (the highly classified volumes) is now in course of production. The entries are being keyboarded for computerization. It is hoped that grants may be forthcoming to include Volumes 1 and 2.

Finance, accommodation, consultants and staff

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References

7. According to D. M. Norris (A history of cataloguing and cataloguing methods, 1100-1850. London: Grafton, 1939, p. 147), the second Bodleian catalogue published in 1620 and compiled by Thomas James was the first general library catalogue to be arranged in alphabetical order of the authors' surnames.
8. Members of the Classification Research Group with whom I discussed problems of devising the classification scheme have been most helpful. An account of some of these discussions is given in Journal of Documentation, 34 (1978), 30-33.

Indexer rewarded

‘Bennet Woodcroft ... left a Manchester practice as a patent agent to come to London to teach machinery at University College. His work on indexing the patents buried in the public records so impressed a Parliamentary committee in 1852 that he was given the key post (to do with specification) in the reformed London Patent Office.’


*Since this article was written further grants have been received which should make it possible to complete the project.